During the forecast period, the contribution of the early-adopter education and government segments will decline as ATM moves into the corporate space and as more local providers begin pursuing sales to ISPs.

Table 21 presents local ATM revenue by customer type from 1996 to 2001. During the forecast period, the contribution of the early-adopter education and government segments will decline as ATM moves into the corporate space and as more local providers begin pursuing sales to ISPs. However, IDC believes that public entities such as hospitals and universities will represent a relatively larger contribution to local providers' revenue than will be the case for national/international providers.

Table 21
U.S. Local ATM Service Revenue Share by Customer Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Corporate	27.6	30.0	33.0	35.0	37.0	39.0
Education	34.0	33.0	31.0	29.0	27.0	25.0
Government	29.0	28.0	26.0	24.0	22.0	20.0
Other network service providers	9.4	9.0	10.0	12.0	14.0	16.0
Total revenue ($M)	11.5	38.2	73.8	134.9	223.1	337.0

Source: International Data Corporation, 1997

Local ATM Forecast Assumptions

The following assumptions are specific to IDC's forecast for the local ATM market:

- Local ATM service pricing is significantly lower than that of national/international service, and this situation will persist throughout the forecast period. IDC expects a declining price trend from 1996 to 2001 (-4% CAGR for T1 ATM ports, -3% for T3 ports, and -1% for OC-3 ports) as CLECs such as ACSI, Teleport, and U S West's national data services entity put pressure on incumbent providers.
- In the local ATM market, OC-3 ports represent a higher percentage of total ports than is the case in the national/international market. This situation is attributable to the overall lower price levels of local ATM and to the relatively small price differential between T3 and OC-3 services charged by many operators.
- Education and government represent a larger proportion of local providers' ATM customer base compared with that of national providers because the operations of such entities (hospitals, universities, and state government) tend to be concentrated within a single region.

Some local providers, such as BellSouth, Pacific Bell, and GTE, have implemented service interconnection with local operators in contiguous service territories.

- Some local providers, such as BellSouth, Pacific Bell, and GTE, have implemented service interconnection with local operators in contiguous service territories. Such arrangements will fuel growth in the local ATM market as they facilitate access to wider area ATM networks. Similar arrangements are being pursued

with IXCs, but the rollout of SVCs may provide a more cost-effective means of carrier service interconnection.

- Local providers have shifted their marketing approaches for ATM services by positioning low-speed ATM services as an entry point, particular for smaller customers. Carriers such as Bell Atlantic are pricing the service aggressively, and many service providers, such as Pacific Bell and MCI, expect ATM T1 ports to grow faster than T3 and OC3 ports.

Local carriers are also planning to introduce managed ATM services to stimulate mass-market acceptance.

- Local carriers are also planning to introduce managed ATM services to stimulate mass-market acceptance. GTE currently offers managed transparent LAN service through its Virtual Central Office offering. Other LECs, such as Pacific Bell, Southwestern Bell, and U S West, plan to roll out managed ATM service offerings in 1997 or 1998.

National/International ATM Market Share and Trends

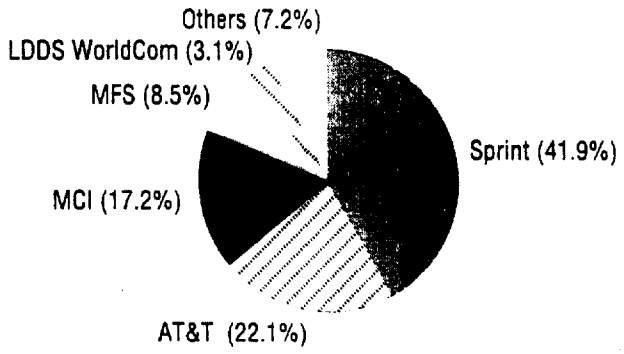
Sprint is the ATM services market leader in terms of both revenues (41.9%) and ports (38.0%) at midyear 1997.

The national/international ATM market reached $65.0 million at yearend 1996. Figures 33 and 34 show that Sprint is the ATM services market leader in terms of both revenue (41.9%) and ports (38.0%) at midyear 1997, representing a slight market share decline from yearend 1996. AT&T holds the number-two position in terms of revenue with a 22.1% market share, followed by MCI with 17.2%. Factors accounting for Sprint's ATM leadership position include the carrier's relatively greater success in the corporate and ISP market segments and its promotion of frame-relay-to-ATM service internetworking.

The national/international ATM services market will increase at a 1996–2001 CAGR of 91% to $1.6 billion in 2001 (see Figure 35). National providers had 147 customers at yearend 1996 with 630 ports in service (see Table 22). By 2001, the national ATM customer base will increase to nearly 2,000 (a 1996–2001 CAGR of 69%) and ports are expected to reach 16,833, a 1996–2001 CAGR of 94%.

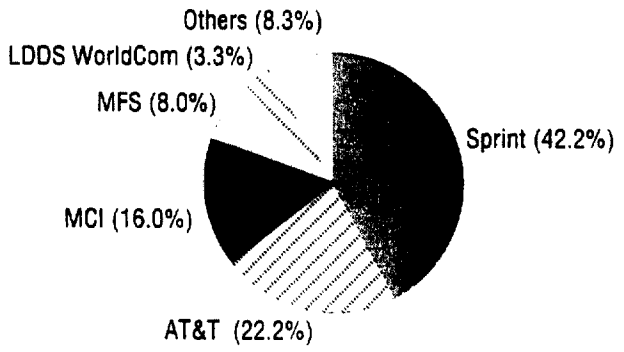
Figure 33
U.S.-Based National/International ATM Service Revenue Share by Provider, Midyear 1997 and Yearend 1996

Midyear 1997



Total = $61.4M

Yearend 1996

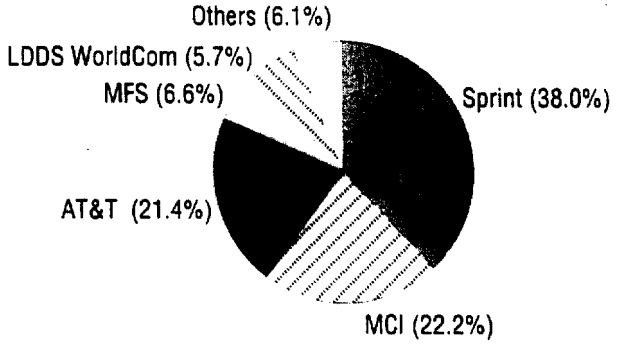


Total = $65.0M

Source: International Data Corporation, 1997

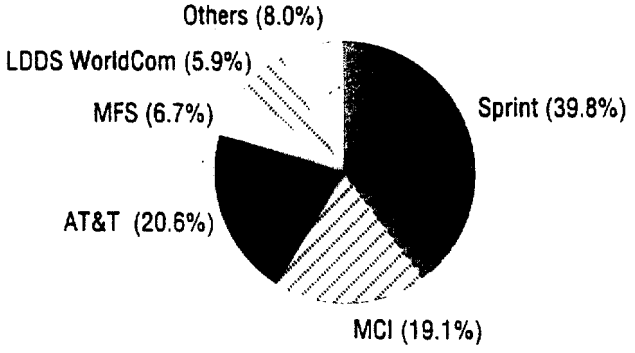
Figure 34
U.S.-Based National/International ATM Port Installed Base Share by Provider, Midyear 1997 and Yearend 1996

Midyear 1997



Total = 948

Yearend 1996

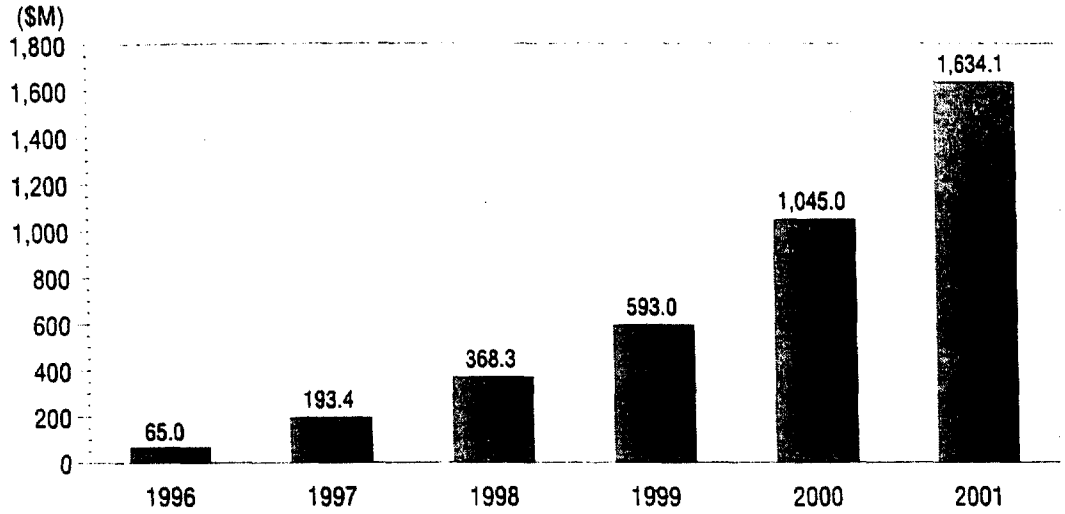


Total = 630

Source: International Data Corporation, 1997

Figure 35

U.S.-Based National/International ATM Service Revenue, 1996–2001



Source: International Data Corporation, 1997

Table 22

U.S.-Based National/International ATM Customers and Port Installed Base, 1996–2001

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
Customers	147	312	540	774	1,315	1,980	68.9
Ports	630	1,872	3,507	5,805	10,521	16,833	94.5
Average ports per customer	4	6	7	8	8	9	15.2

Source: International Data Corporation, 1997

The national/international provider port speed segmentation forecast is presented in Table 23. During the forecast period, IDC expects national providers also to see T1 ATM increase as a percentage of the total market as large customers use the service to link branch offices to corporate hubs. Because national providers have more ports per customer on average than do local providers, T1 ATM will account for a higher percentage of overall ports (37% of the total by 2001). T3 ATM will decline as a percentage of the total as customers move both up and down the access speed continuum. OC-3 will experience gains (14% of the total in 2001) as large corporate customers and major ISPs implement higher-speed ATM services to link growing networks.

Table 24 presents national ATM revenue by customer type. The corporate segment will increase from 53% of the total in 1996 to 65% in 2001. The ISP segment will also increase its contribution, given the overall growth in Internet traffic and the expansion of tier-one ISPs. During IDC's research, national providers indicated that the education market is not an important segment.

Government will decline as a percentage of the total as corporate users and ISPs join this early-adopter segment in the market.

Table 23

U.S.-Based National/International ATM Port Installed Base Share by Access Speed, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
T1	17.6	19.5	20.0	25.0	30.0	37.0
T3	74.7	72.0	70.0	64.0	58.0	49.0
OC-3	7.7	8.5	10.0	11.0	12.0	14.0
Total ports	630	1,872	3,507	5,805	10,521	16,833

Source: International Data Corporation, 1997

Table 24

U.S.-Based National/International ATM Service Revenue Share by Customer Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Corporate	53.5	55.0	57.0	60.0	63.0	65.0
Education	0.0	0.0	0.0	0.0	0.0	0.0
Government	28.7	26.5	23.0	19.0	15.0	12.0
Other network service providers	17.8	18.5	20.0	21.0	22.0	23.0
Total revenue ($M)	65.0	193.4	368.3	593.0	1,045.0	1,634.1

Source: International Data Corporation, 1997

National/International ATM Forecast Assumptions

The following assumptions pertain to the national/international ATM markets:

Unlike their local counterparts, most national providers offer managed ATM services.

- National ATM service pricing is considerably higher than its local equivalent, primarily because of the long distance components factored into the national service pricing structure.
- Unlike their local counterparts, most national providers offer managed ATM services. However, they expect to see increased interest in managed services by yearend 1998 as the market matures.
- National providers are emphasizing ATM service applications, along the lines of WorldCom's solution-specific ATM services, such as LAN connection service, ATM switch-to-switch service, and high-speed LAN interconnection service.
- The international revenue of U.S.-based ATM service providers is negligible (less than 1% of total revenue) and will remain so throughout the forecast period. MCI and Cable & Wireless launched commercial service between the United States and the United Kingdom during the first half of 1997, and AT&T launched

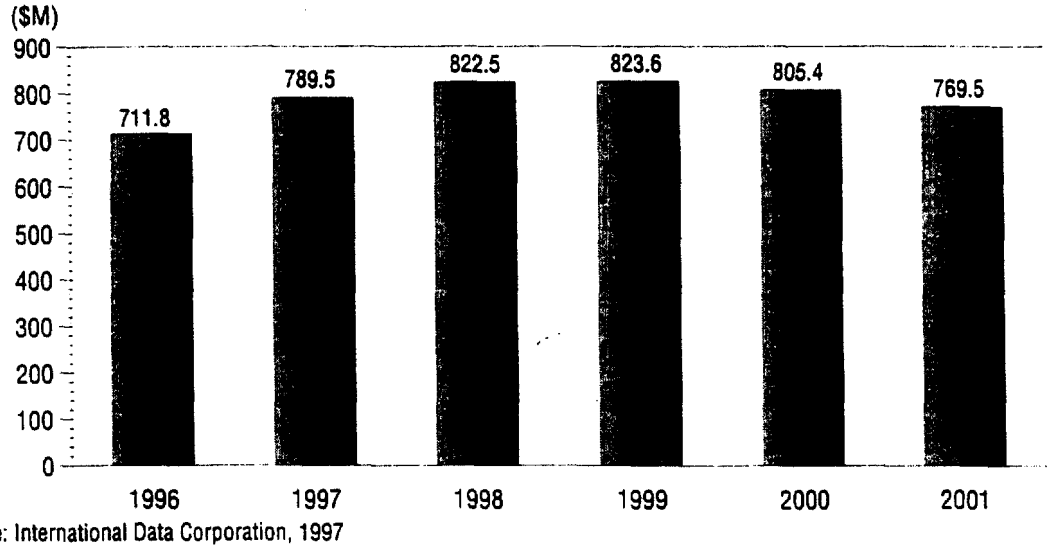
service between the United States and Japan during the same time frame. AT&T plans to launch service between the United States and Europe through its U.K. subsidiary and through AT&T Unisource. MCI plans to roll out global ATM services with Concert Communications Services. However, IDC expects demand for international ATM service to be relatively limited.

X.25 Services

Although the X.25 services will grow 11% in 1997 to reach $789.5 million, X.25 is not a long-term growth market.

Packet-switched X.25 service remains a key market segment, having generated revenue of $711.8 million in 1996. Although the X.25 services will grow 11% in 1997 to reach $789.5 million, X.25 is not a long-term growth market (see Figure 36). IDC forecasts that the overall market will flatten in 1998 and begin to decline in 1999, settling at $769.5 million in 2001 as users migrate to frame relay and IP. U.S.-based providers' revenue generated in the U.S. market will decline, but there will be revenue growth from traffic generated outside the United States.

Figure 36
U.S. X.25 Service Revenue, 1996–2001



Source: International Data Corporation, 1997

Table 25 presents IDC's X.25 customers and ports forecast. At the end of 1996, there were 8,346 X.25 customers and 148,252 ports; these figures represent an average number of ports per customer of 18. During the forecast period, the total number of ports will increase at a 1996–2001 CAGR of 7.5%, but the number of customers will begin to fall in 1999 because of migration to other technologies. As a result, toward the end of the forecast period, X.25 port growth will come from existing customers' network expansion.

Table 26 shows X.25 connections by port type. At the end of 1996, 62% of all X.25 connections were dial-up connections. In 2001, dial-up connections as a percentage of the total will increase to nearly 70%. The increased contribution of dial-up access is attributable to continued use of X.25 for Internet/online service provision and access, traditional X.25 applications such as point-of-sale transactions, and niche applications such as remote access/ telecommuting. During the forecast period, dedicated X.25 service will decline in favor of frame relay.

Table 25
U.S. X.25 Customers and Port Installed Base, 1996–2001

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
Customers	8,348	8,808	9,013	8,951	8,640	8,405	0.1
Ports	148,252	169,905	186,282	200,632	209,084	212,573	7.5
Average ports per customer	18	19	21	22	24	25	7.3

Source: International Data Corporation, 1997

Table 26
U.S. X.25 Connection Share by Port Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Dial	62.3	63.0	65.1	67.3	68.5	69.6
Dedicated	37.7	37.0	34.9	32.7	31.5	30.4
Total connections	148,252	169,905	186,282	200,632	209,084	212,573

Source: International Data Corporation, 1997

Table 27 and Figure 37 show the access speed distribution of X.25 dedicated connections. Overall, the mix changes only slightly; 9.6Kbps and 56Kbps ports accounted for the majority of dedicated connections.

IDC believes that major online service providers and ISPs will eventually move toward dial IP networks, but second-tier providers and those with international operators will stay with X.25.

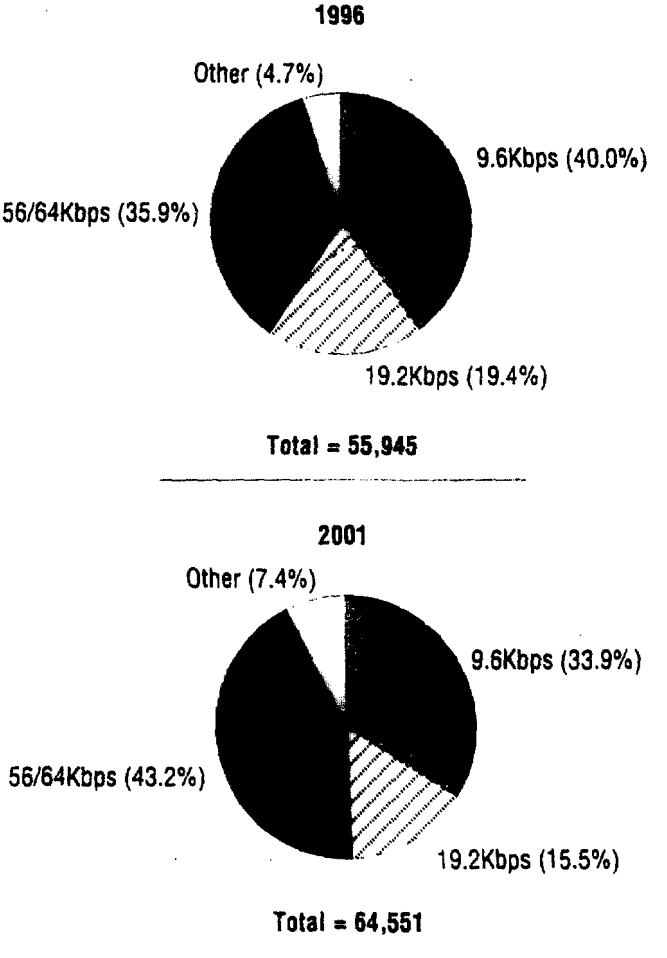
Table 28 and Figure 38 present IDC's revenue forecast by customer type. The percentage of revenue attributable to other network service providers stood at nearly 40% in 1996 and will decline to about 15% in 2001. Sprint, the largest X.25 service provider, has a number of ISP customers, including America Online (its single-largest X.25 customer) and CompuServe. IDC believes that major online service providers and ISPs will eventually move toward dial-up IP networks, but second-tier providers and those with international operators will stay with X.25. On the corporate side, X.25 will continue to be used for traditional financial applications, as well as in other areas such as remote LAN access and PPP over X.25 for Internet access in regions with less developed telecommunications infrastructures.

Table 27
U.S. X.25 Dedicated Connections by Access Speed, 1996–2001

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
9.6Kbps	22,368	23,701	23,856	23,296	22,848	21,856	-0.5
19.2Kbps	10,868	11,831	11,674	11,240	10,758	10,001	-1.6
56/64Kbps	20,085	24,293	25,812	26,817	27,707	27,888	6.8
Other	2,624	3,120	3,590	4,247	4,599	4,806	12.9
Total	55,945	62,946	64,932	65,600	65,913	64,551	2.9

Source: International Data Corporation, 1997

Figure 37
U.S. X.25 Dedicated Connection Share by Access Speed, 1996 and 2001



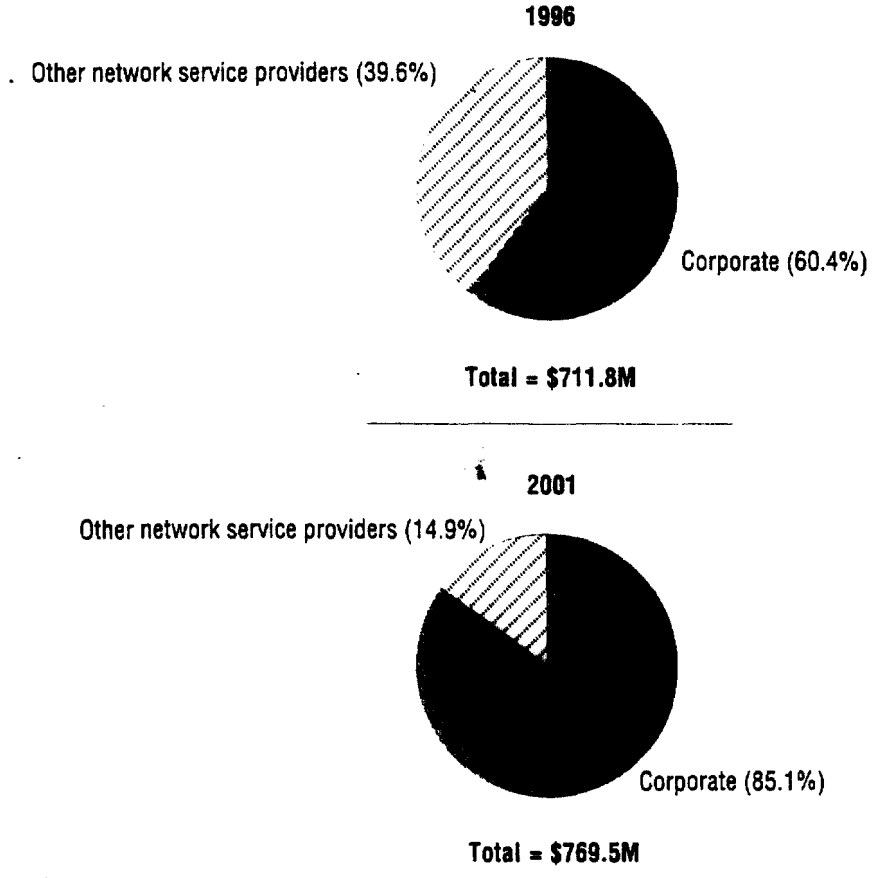
Source: International Data Corporation, 1997

Table 28
U.S. X.25 Service Revenue by Customer Type, 1996–2001 ($M)

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
Corporate	430.3	516.1	577.9	619.3	645.4	654.6	8.8
Other network service providers	281.5	273.5	244.6	204.3	160.0	114.9	-16.4
Total	711.8	789.5	822.5	823.6	805.4	769.5	1.6

Source: International Data Corporation, 1997

Figure 38
U.S. X.25 Service Revenue Share by Customer Type, 1996 and 2001



Source: International Data Corporation, 1997

Market Forecast Assumptions

The following forecast assumptions relate to the X.25 market as a whole (assumptions specific to the local and national/international markets are outlined in the next section):

- The total X.25 market will grow only slightly during the forecast period as migration to frame relay and IP services erode the customer base.
- The slight 2% market growth will be fueled by customers' continued use of X.25 service for traditional applications such as financial transactions, as well as more recent applications such as remote LAN access. Online service providers also use X.25 as an Internet connectivity option. For traditional applications, X.25's reliability remains a major benefit.
- The market will shift in favor of dial-up X.25 service as dedicated customers migrate to higher-bandwidth technologies.

The X.25 market will grow more rapidly outside the United States.

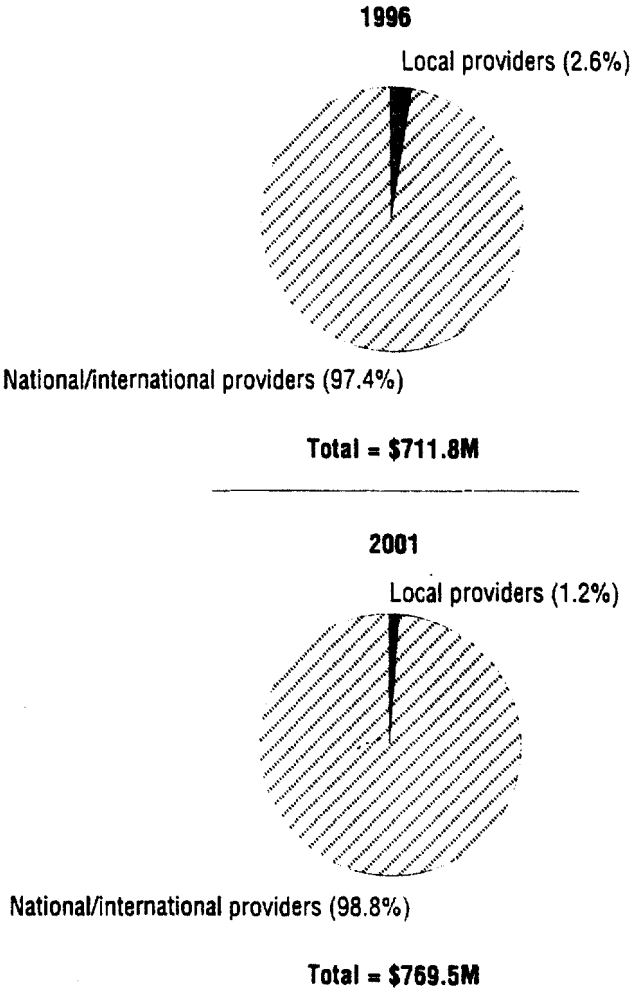
- The X.25 market will grow more rapidly outside the United States, and a significant portion of U.S.-based providers' revenue will result from traffic originating overseas.

Segmentation Analysis: Local and National/International Market

Figure 39 shows that national/international providers accounted for the bulk of total X.25 service revenue in 1996 (97%) and that this segment's share will increase to 99% by 2001.

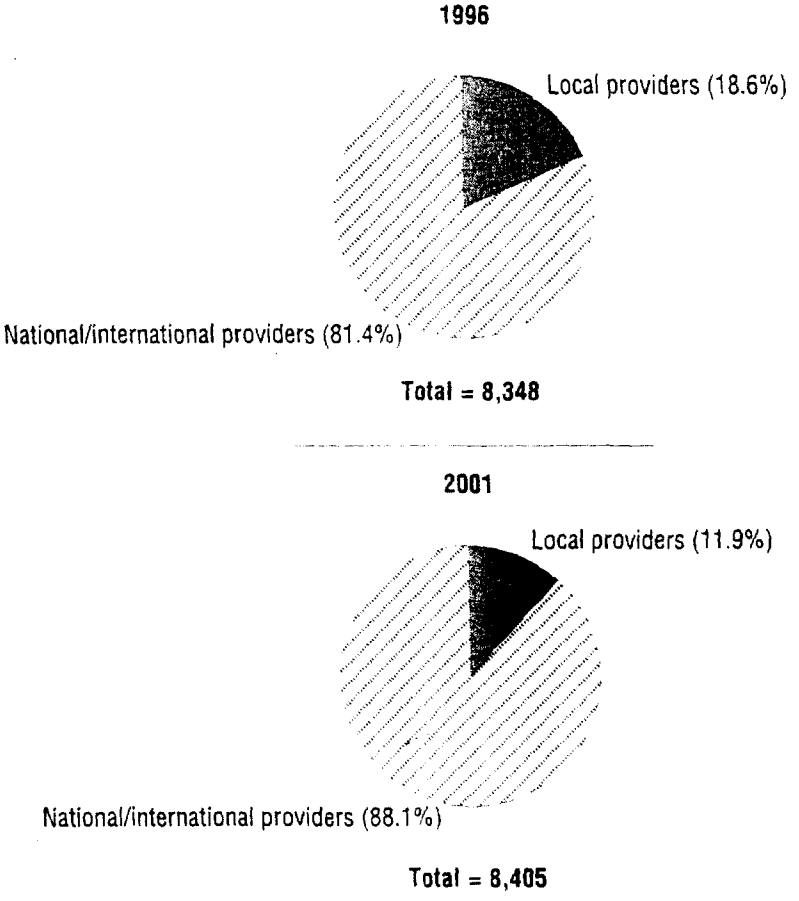
National providers accounted for approximately 81% of the total X.25 customer base in 1996 (see Figure 40) and 96% of total X.25 connections (see Figure 41).

Figure 39
U.S. X.25 Service Revenue Share by Provider Segment, 1996 and 2001



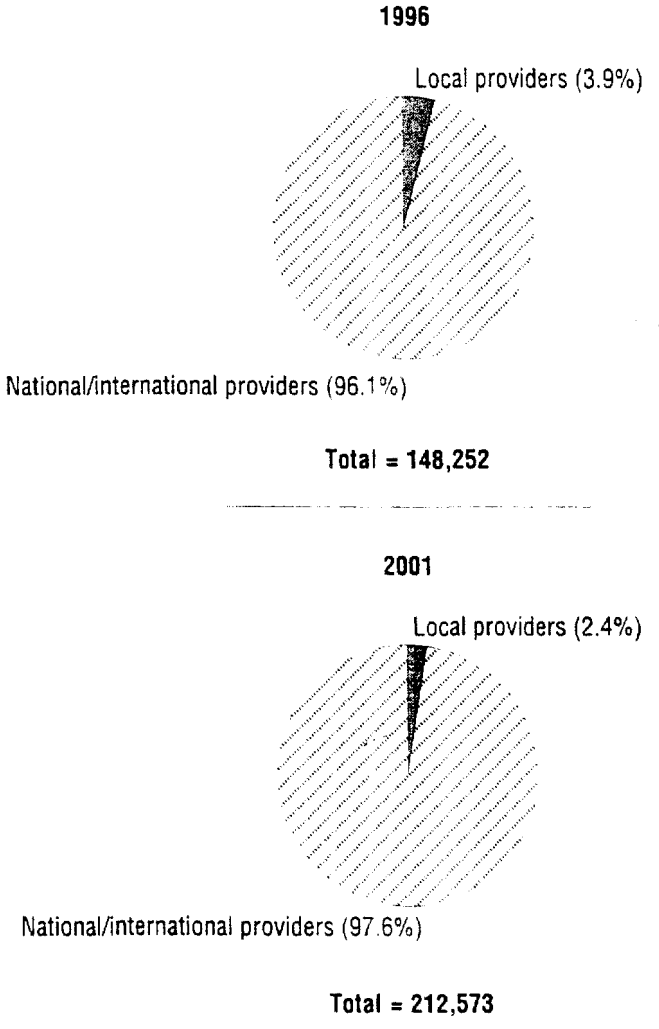
Source: International Data Corporation, 1997

Figure 40
U.S. X.25 Customer Share by Provider Segment, 1996 and 2001



Source: International Data Corporation, 1997

Figure 41
U.S. X.25 Connection Share by Provider Segment, 1996 and 2001



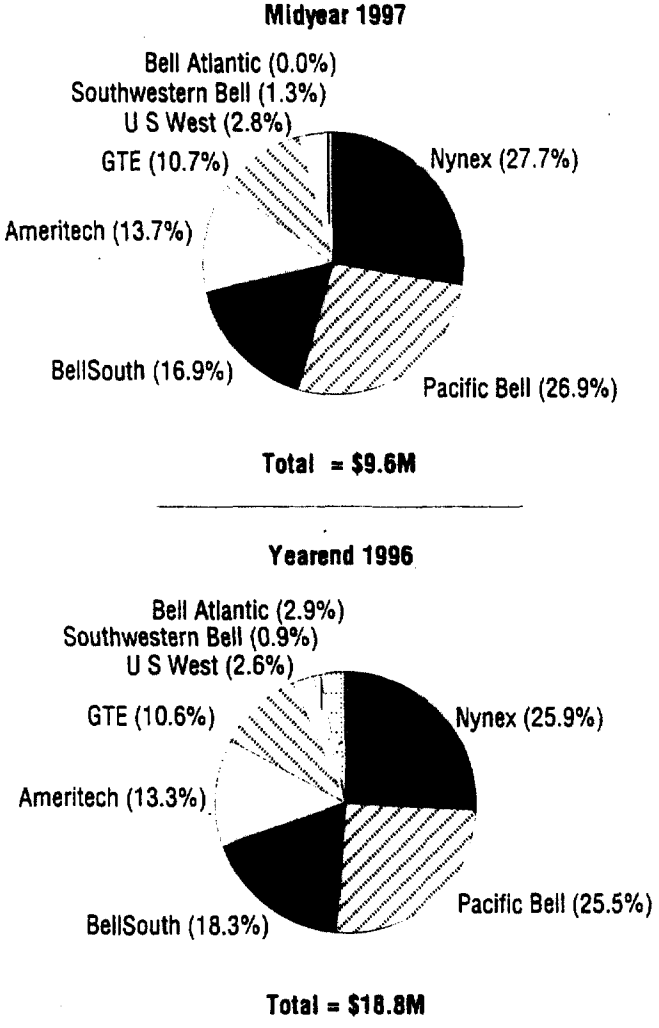
Source: International Data Corporation, 1997

Local X.25 Forecast Trends

Local providers such as Southwestern Bell and Bell Atlantic are migrating X.25 users to ISDN D-channel services.

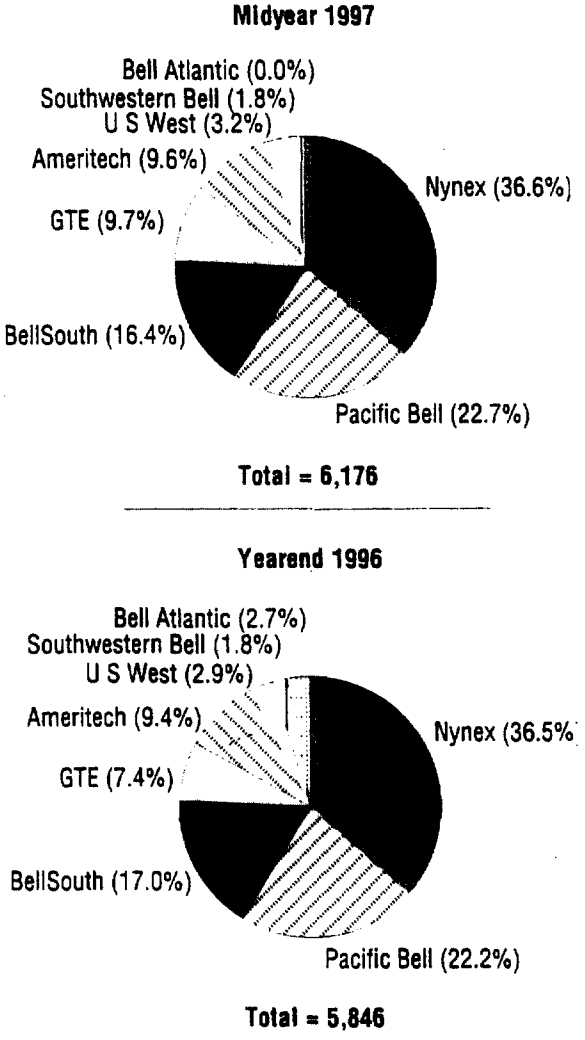
Local X.25 revenue amounted to $18.8 million in 1996. Figures 42 and 43 present midyear 1997 and yearend 1996 revenue- and port-based market share data. Nynex is the market leader, accounting for 27.7% of revenue and 36.6% of ports at midyear 1997. Corporate users with dedicated connections dominate Nynex's customer base. Other local providers, such as Southwestern Bell and Bell Atlantic, are migrating X.25 users to ISDN D-channel services.

Figure 42
U.S. Local X.25 Service Revenue Share by Provider, Midyear 1997 and Yearend 1996



Source: International Data Corporation, 1997

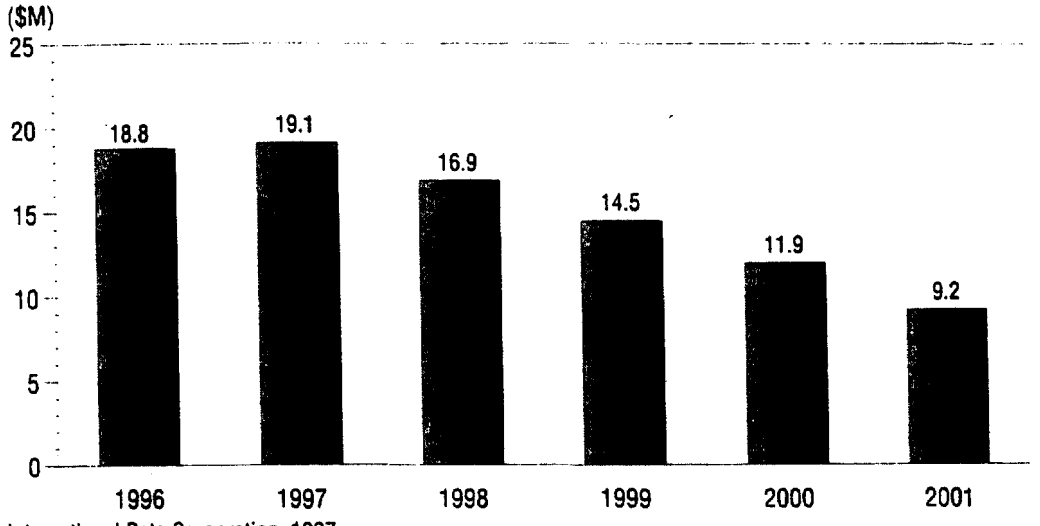
Figure 43
U.S. Local X.25 Port Installed Base Share by Provider, Midyear 1997 and Yearend 1996



Source: International Data Corporation, 1997

Figure 44 shows that local X.25 revenue will fall to $9.2 million in 2001 at a 1996–2001 CAGR of 13%. Table 29 presents local X.25 customers and ports, which will decline at 1996–2001 CAGRs of 8% and 2%, respectively. The average number of ports per customer will remain constant after 1997.

Figure 44
U.S. Local X.25 Service Revenue, 1996–2001



Source: International Data Corporation, 1997

Table 29
U.S. Local X.25 Customers and Port Installed Base, 1996–2001

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
Customers	1,552	1,364	1,180	1,169	1,110	999	-8.4
Ports	5,846	6,138	6,138	6,076	5,773	5,195	-2.3
Average ports per customer	4	5	5	5	5	5	6.7

Source: International Data Corporation, 1997

As shown in Table 30, dial-up connections as a percentage of the total will overtake dedicated connections, with the former reaching 55% by 2001. Table 31 shows that 9.6Kbps connections will constitute the bulk of connections (70%) in 2001. Higher-speed ports will increase slightly as a percentage of the total during the forecast period. Corporate customers will account for a greater share of local revenue during the forecast period: 77% in 1996 and 91% in 2001 (see Table 32).

Table 30

U.S. Local X.25 Connection Share by Port Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Dial	34.4	35.0	40.0	45.0	50.0	55.0
Dedicated	65.6	65.0	60.0	55.0	50.0	45.0
Total connections	5,846	6,138	6,138	6,076	5,773	5,195

Source: International Data Corporation, 1997

Table 31

U.S. Local X.25 Dedicated Port Installed Base Share by Access Speed, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
9.6Kbps	76.4	76.9	74.0	73.0	71.0	70.0
19.2Kbps	1.4	1.0	1.0	1.0	1.5	2.0
56/64Kbps	18.0	17.8	19.0	20.0	21.0	22.0
Other	4.3	4.3	6.0	6.0	6.5	6.0
Total dedicated ports	3,835	3,990	3,683	3,342	2,886	2,338

Source: International Data Corporation, 1997

Table 32

U.S. Local X.25 Service Revenue Share by Customer Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Other network service providers	23.0	20.0	17.0	14.0	11.0	9.0
Corporate	77.0	80.0	83.0	86.0	89.0	91.0
Total revenue ($M)	18.8	19.1	16.9	14.5	11.9	9.2

Source: International Data Corporation, 1997

Local X.25 Forecast Assumptions

The following assumptions pertain to the local X.25 market:

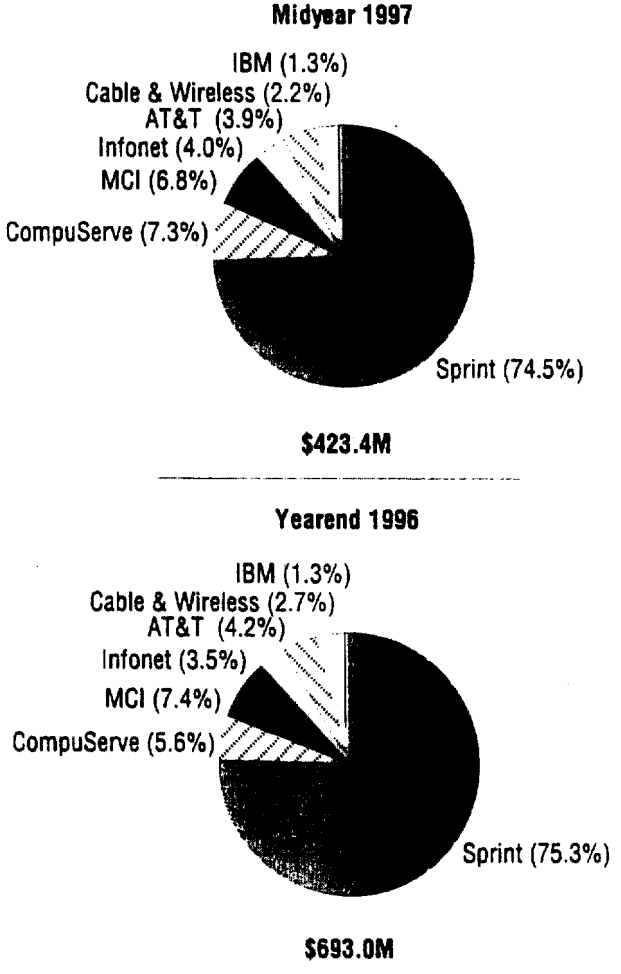
- The local market will shrink during the forecast period as X.25 providers discontinue their offerings and migrate customers to other technologies. Some service providers have indicated that they will migrate their dedicated X.25 customers to ISDN D-channel services. IDC expects that a number of dial-up X.25 customers will migrate to frame relay or dial-up IP services during the forecast period.
- X.25 service providers will lower prices to maintain price competitiveness with other higher-bandwidth technologies, most significantly for dial-up access (-10% during the forecast period) and 9.6Kbps service (-11%).

National/International X.25 Forecast Trends

Sprint holds a commanding lead in the X.25 market, with 74.5% of revenue and 86.2% of total ports at midyear 1997.

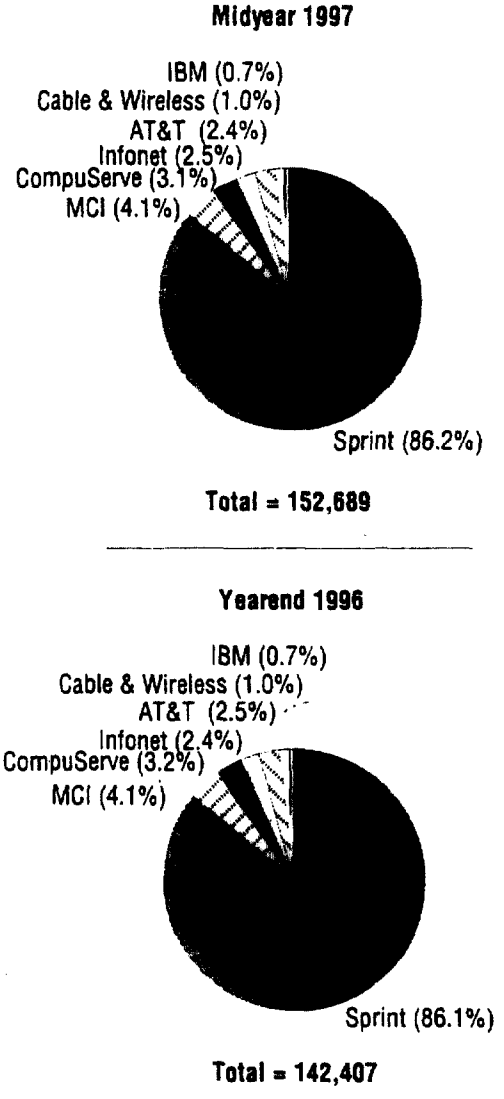
The market for national/international X.25 service reached $693.0 million in 1996. Figures 45 and 46 show that Sprint holds a commanding lead in the X.25 market, with 74.5% of revenue and 86.2% of total ports at midyear 1997. America Online accounts for a significant percentage of Sprint's total revenue and represents the bulk of its dial-up business. Overall, dial-up X.25 ports represent 70% of Sprint's total X.25 connections. CompuServe holds the number-three market position in terms of ports (3.1%), but places second in terms of revenue (7.3%), given that it has a higher proportion of higher-speed dedicated ports in service than MCI.

Figure 45
U.S.-Based National/International X.25 Service Revenue Share by Provider, Midyear 1997 and Yearend 1996



Source: International Data Corporation, 1997

Figure 46
U.S.-Based National/International X.25 Port Installed Base Share by Provider, Midyear 1997 and Yearend 1996



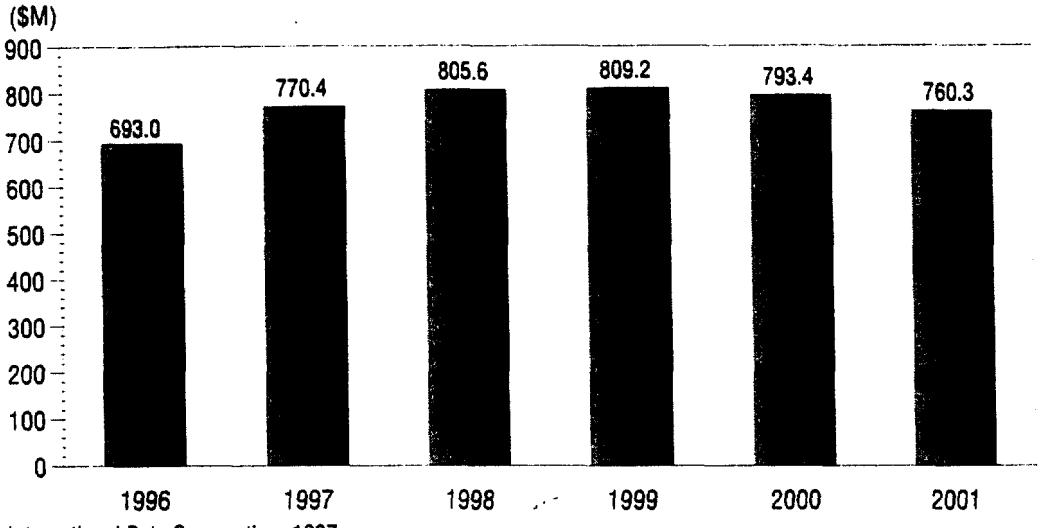
Source: International Data Corporation, 1997

IDC forecasts that the X.25 market will amount to $760.3 million in 2001, for a 1996–2001 CAGR of 1.9% (see Figure 47). Table 33 presents IDC's national X.25 customers and ports forecast through 2001. This segment had 6,796 customers in 1996 with a total of 142,407 ports in service. The number of customers will increase to 7,406 in 2001, for a 1996–2001 CAGR of 1.7%. However, the customer base will begin to decline in 1999 as port growth slows and remaining customers add connections.

At yearend 1996, dial connections accounted for 63% of total national X.25 ports (see Table 34). In 2001, dial-up connections will represent 70% of total connections. The dedicated X.25 port speed mix will shift somewhat during the forecast period. As illustrated in Table 35, 56/64Kbps services will account for the bulk of X.25 connections (44%) by 2001, followed by 9.6Kbps with 32%.

Figure 47

U.S.-Based National/International X.25 Service Revenue, 1996–2001



Source: International Data Corporation, 1997

Table 33

U.S.-Based National/International X.25 Customers and Port Installed Base, 1996–2001

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
Customers	6,796	7,444	7,832	7,782	7,530	7,406	1.7
Ports	142,407	163,768	180,144	194,556	203,311	207,377	7.8
Average ports per customer	21	22	23	25	27	28	6.0

Source: International Data Corporation, 1997

Table 34

U.S.-Based National/International X.25 Connection Share by Port Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Dial	63.4	64.0	66.0	68.0	69.0	70.0
Dedicated	36.6	36.0	34.0	32.0	31.0	30.0
Total connections	142,407	163,768	180,144	194,556	203,311	207,377

Source: International Data Corporation, 1997

Table 35
U.S.-Based National/International X.25 Dedicated Port Installed Base Share by Access Speed, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
9.6Kbps	37.3	35.0	34.5	33.5	33.0	32.5
19.2Kbps	20.8	20.0	19.0	18.0	17.0	16.0
56/64Kbps	37.2	40.0	41.0	42.0	43.0	44.0
Other	4.7	5.0	5.5	6.5	7.0	7.5
Total dedicated ports	52,110	58,956	61,249	62,258	63,026	62,213

Source: International Data Corporation, 1997

Sprint, as the dominant X.25 service provider, has already witnessed a shift on the part of online/Internet service providers away from X.25 in favor of dial-up IP service.

National providers' customer mix will shift during the forecast period in favor of the corporate segment, which accounted for 60% of total revenue in 1996 and will reach 85% of total revenue in 2001 (see Table 36). Sprint, as the dominant X.25 service provider, has already witnessed a shift on the part of online/Internet service providers away from X.25 in favor of dial-up IP service.

Table 36
U.S.-Based National/International X.25 Service Revenue Share by Customer Type, 1996–2001 (%)

	1996	1997	1998	1999	2000	2001
Other network service providers	40.0	35.0	30.0	25.0	20.0	15.0
Corporate	60.0	65.0	70.0	75.0	80.0	85.0
Total revenue ($M)	693.0	770.4	805.6	809.2	793.4	760.3

Source: International Data Corporation, 1997

National/International X.25 Forecast Assumptions

The following assumptions pertain to the national/international X.25 market:

- IDC forecasts that overall port growth will continue in the national market, but will flatten toward the middle of the forecast period, when growth will be driven primarily by additional connections for existing customers.
- Carriers' need to retain their customer bases will also affect the national/international X.25 market, resulting in compound annual price decreases of -8% for dial-up service and -10% for 9.6Kbps dedicated service.
- The geographic mix of U.S.-based providers' X.25 service revenue will shift during the forecast period. The U.S. market accounted for 63% of U.S.-based national/international providers' services revenue in 1996. In 2001, the U.S. market will represent only

44.0% of total revenue (see Table 37 and Figure 48). The migration affecting the U.S. market will emerge in the Western European market toward the end of the forecast period. Growth in other regions will be driven largely by demand for PPP over X.25 and remote LAN access.

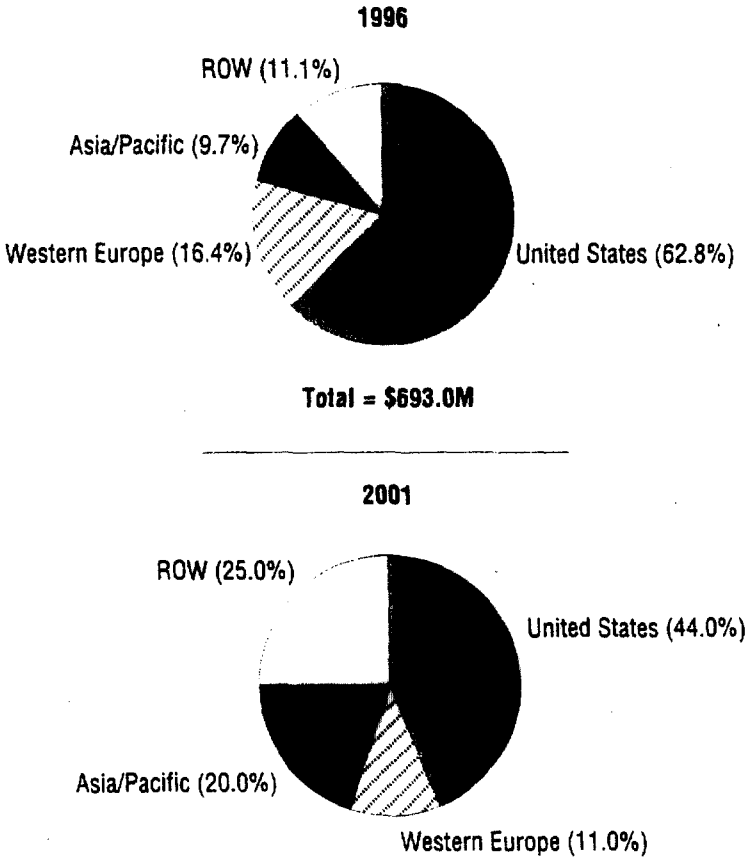
Table 37

U.S.-Based National/International X.25 Service Revenue by Region, 1996–2001 ($M)

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
United States	435.3	446.8	443.1	412.7	372.9	334.5	-5.1
Western Europe	113.6	123.3	128.9	121.4	103.1	83.6	-5.9
Asia/Pacific	67.0	92.4	104.7	121.4	142.8	152.1	17.8
ROW	77.1	107.9	128.9	153.7	174.6	190.1	19.8
Total	693.0	770.4	805.6	809.2	793.4	760.3	1.9

Source: International Data Corporation, 1997

Figure 48
U.S.-Based National/International X.25 Service Revenue Share by Region, 1996 and 2001



Source: International Data Corporation, 1997